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5. MARZIORE 1895.

PHOTOGRAPHED BY H. J. W. 1895

Gustaf Retzius

GUSTAF RETZIUS, 1842-1919

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IT is given to few men to become outstanding leaders in any field of science, and positions of eminence simultaneously in several fields are at the present time almost impossible of attainment. Such a position was, however, occupied by the subject of our sketch in each of the sciences of anatomy and its sister, anthropology. To both of these fields of knowledge he made contributions of enduring worth in some of their most difficult branches. As if this were not sufficient to absorb his energy and zeal, several volumes of poems, both original and translated, numerous sketches of his extensive travels in other lands, political writings, and other forms of literary endeavor emanated from his prolific and resourceful pen.

Magnus Gustaf Retzius was born in Stockholm, October 17, 1842. He came of a family which was distinguished in science and medicine, not only in his native land, but at least in the case of his father, throughout Europe and America.

His father, the celebrated anatomist and ethnologist, Anders Adolf Retzius, was professor of anatomy at the Caroline Medico-Chirurgical Institute of Stockholm. This position he held from 1824 until his death, which occurred in 1860. Anders Adolf Retzius was born in Lund on October 13, 1796. He studied at the University of Lund, and then for a time at Copenhagen. On his return to Sweden he gravitated toward the capital while still a youth, for we learn that in 1818, Anders Johan Retzius, the father of Anders Adolf, who had been ill for some time, received a stroke which paralyzed the lower part of his body. Anders Retzius the younger, therefore, came to Lund and took his father to Stockholm.

On December 27, 1823, Anders Retzius, the father of Gustaf, was appointed professor of veterinary science in the veterinary school of Stockholm and, on September 16 of the following year, he was made professor of anatomy at the Caroline Medico-Chirurgical Institute. He was then 28 years of age. This position he continued to hold until his death, as previously stated.

The Caroline Institute had been founded but a few years previously, in 1815, and it appears due very largely to the organizing ability and the scientific work of Anders Retzius that this medical school attained the position of prominence which it has come to occupy in the Scandinavian countries.

Anders Johan Retzius, the grandfather of Gustaf, was professor of natural history at the University of Lund from 1787 until 1812. He appears to have been interested particularly in rocks and minerals, for he presented a collection of these to the University in 1815, which is mentioned in the record of the University celebration in 1897, which marked the quarter century of the reign of King Oscar II.

An uncle of Gustaf, Magnus Christian Retzius, from whom the subject of our sketch apparently received his first name which, however, was seldom used in later life, was also born in Lund. He was two years the senior of Anders Adolf. He completed the medical course at Lund and received the degree of Doctor of Medicine in 1815. Soon after this, apparently, he removed to Stockholm. Before taking his degree he had served as battalion surgeon with the Swedish army in the campaign against Norway in 1814. In later life he occupied various positions of eminence on the medical staff of the army and also built up an extensive medical practice in Stockholm.

The scholarly traditions of his family showed themselves by numerous medical and anatomical contributions. Magnus Christian Retzius died October 1, 1871.

By the removal of the two brothers to Stockholm, and by the bringing to that city also of their father in his old age, the Retzius family was now established in the capital city of the country. Here Anders Adolf married Emilia Wahlberg, also of a family distinguished for its love of natural history and scientific pursuits. One brother of the mother of Gustaf was a botanist, apparently of some note in his own country, and another brother was an engineer and explorer.

With this background it is not surprising that the young Gustaf should have developed the remarkable zeal for biological science which characterized his work for more than half a century.

Concerning his boyhood and his veneration of his father we have a glimpse in a letter² which he wrote in 1892 when he was at the height of his powers, and already famous. This letter was written to the editor of a series of short sketches and auto-

² Retzius, Gustaf, "Själfbiografisk skizz. Autografin och porträter af framstående personer," Ser. 3, 1892, Hft. 9 b.

graphs of the leading men of Sweden. Because of the illumination it sheds on the character of the son himself it is worth quoting in full in a translation which has attempted to preserve the spirit of the original, although the phraseology on that account appears here and there somewhat clumsy in the English.

Mr. Editor:—

When to-day, April 18th, the anniversary of my father's death, I received your letter requesting me to send you my autograph, it appeared particularly fitting to sketch a few of the pictures from the past which such an anniversary calls forth for recollection.

It is now 32 years since my father, after a few days' illness, was suddenly sent away from his comprehensive and influential work. He had recently been greatly pleased that the same Spring I should become a student and that soon thereafter he should have me as a disciple in the anatomical lecture room in which for more than thirty-five years with never-tiring energy, love and wisdom he had fostered generation after generation of the healing art's young followers. And I was delighted at the prospect with all the enthusiasm of youth. His death put an end to the hopes of us both, and although a couple of weeks later I donned the white cap in Upsala—after having with my father's approbation "hopped over" the fourth ring in the gymnasium—yet I felt to the full extent the irretrievable loss I had suffered.

I had by the exertion of all of my young strength worked myself through the long hated requirements of the school, with its narrow-minded coercion, unnecessary grinding, needless and musty lore, in order to be initiated into the world where all of my desire was: nature's wonderful world, under an awake, inspired and learned father's leading.

And thus the leader went away, just as I stood at the threshold. I felt myself uncertain, groping. But I cast myself in, however, with other seekers after knowledge, and so proceeded further on the way, sometimes with tottering steps. But the way led nevertheless forward.

When I now in retrospect think upon how it came about that I followed in my father's footsteps, that I not only became a naturalist, but particularly anatomist, histologist and anthropologist, then I see that it occurred because he, although gone, has yet been my invisible leader. The seed which he implanted in my mind in my years of childhood have long afterward sprouted.

In very truth during my youth neither my father nor I had time for much talk with one another. He was occupied all day in absorbing work, with his instructing, his scientific researches, his correspondence and with a thousand other tasks which were foremost for his restless spirit's industry. I also had my constant school-going which not seldom led to real over-exertion. But I met him at meal times, saw and heard him often in company with others, especially noted naturalists, Swedish as well as foreigners, the last named of whom sought him in Stockholm on their summer trips. I was permitted during my gymnasium years to accompany him on journeys to Germany, France and Switzerland and was thus, in his company, guest of the contemporary most outstanding men among naturalists, such as Johannes Müller, Ernst Heinrich Weber, Rudolph Wagner, Bischoff, Justus Liebig and many others. I heard them discuss scientific problems

with a zeal, a geniality, a devotion, which must make an impression on the mind of a youth. I obtained also thus a little insight into what scientific work is and what it requires. I received a glimpse that it is not on the king's highway one pursues his calling, that the cross-beam demands on all sacrificing patience, a perseverance without limits, an unheard-of spirit of sacrifice. I understood, therefore, even then, better my father's industry at home, his giving himself up to science, his "holy fire."

But there was also something else which made an impression on my young mind. My father worked not alone with books and desk. "Search first and read afterward" was one of his principles. He opened always first nature's book before he turned to the book-shelf. He seized upon knotty problems (certain knots) knowingly, with lively interest, strove for progress in all directions, but foremost of all it was Biology which urged him on, not alone human anatomy and physiology, but all of living nature. Therefore he always tried to plant in his little garden new and useful plants. On this account he sent to his home strange living animals. I long had my trundle-bed in the same room where these animals were generally kept, my father's work- and writing room in his dwelling-house at the Caroline Institute, of which institution he was the inspector and leader, indeed the creator. I remember even yet so well how a large human skeleton stood beside my bed, and how in the window were placed aquaria and jars with lizards and tree-frogs, indeed one of the bellowing giant-frogs of Brazil which when it got loose made room-high jumps. There were casks with young salmon-fry, whose further development my father studied. And each spring when the ice broke up, he took me with him to Kungsholmsbrunn, where we clattered down on the stone piers to the water's edge and gathered small water animals, infusoria, bryozoans, and worms, which we took home to the aquaria. I shall never forget my father's enthusiasm when he observed under the microscope the wonderful life which was unfolded in the water of these aquaria, and of which he with his spirited descriptive art tried to give me an inkling. I shall never forget his burning interest, his love of truth and the alert, keen look, concerning which a foreigner one time said that in case there was any proof needed for immortality, Anders Retzius' glance was such a proof.

Only a single time was I permitted to hear my father lecture in his auditorium. He took me, naming I know not what reason, with him to the anatomical lecture-room and allowed me, gymnasium student, to sit on a bench in the midst of the large crowd of medicophiles, to whom I looked up with reverence. The lecture to which I then listened stands out to-day, after 34 years, in my memory as if I attended it yesterday. Such an original presentation have I never seen or heard since.

He lectured on the trachea, its structure and function. With a vivacity, which for a man of 60 years must be thought phenomenal, with a youthful verve and enthusiasm, of which very few teachers even in their prime are in possession, he gave an illustrated picture of this organ's wonderfully simple, and yet so ingenious structure, and its great importance for mankind. He entered with all his might into his subject. His mobile features made clear the shades of meaning with a clever mimicry. His hearers followed with intense attention the by no means arranged, but all through, spirited exposition. One immediately caught the contagion of zeal and laughed heartily at the original fancies which spiced the lesson, which had quite a different form than that of the ordinary dry lecture. I

have often reflected since then over it and seen that in such manner lectures may have much greater influence than as ordinarily given.

I have here in a few rough sketches tried to delineate the impulses which my father, notwithstanding his death, gave me during my years of youth for my journey through life. Much might be said here of the great example which his outstanding personality gave to all who came into contact with him. Much might also be said of the influence which my mother with her unceasing, devoted interest, and which her brothers, the botanist P. F. Wahlberg, and the engineer-naturalist J. A. Wahlberg, had on my orientation—not least the last named, who daily took his meals at my parents' home. He, who dreamed of nature, often took me as a child, with him on his rambles in the suburbs of Stockholm. He taught me to speak the flowers' "language," and the birds' song—the only music I even to-day understand. And it was earnestly debated that I, as a ten-year-old boy, should go with him to the unknown lands of inner Africa, on his last expedition, where he laid down his life. But if a description of this man's noble personality might be of interest here, yet has this autograph already grown beyond its prescribed limits and it is time to conclude.

The scattered pictures and impressions which I have drawn from my youth may serve at least to show "why I became a naturalist."

But they may serve at the same time to show something which may be of general interest. They may give to those who have the upbringing of children on their hands, a glimpse of the important weight of the influences which in the home and in the environment, affect the child's future development. It is not so much the lessons of the school, admonitions and punishments, which up-foster and give foundations. It is in a much greater degree *living examples*.

GUSTAF RETZIUS

STOCKHOLM, 18 April, 1892

Concerning his studies at Upsala there is little or no information at present available. Since he entered in 1860, at the age of eighteen, and did not receive his medical degree until 1871, he must have spent a number of years at Upsala. He then attended medical lectures at the Caroline Institute for some time. It appears likely that his medical degree was received from the University of Lund, as one of his biographers states, instead of from the Caroline Institute as several others imply, since it was not until 1874 that the Caroline Institute attained the right held by the state universities of Lund and Upsala, to hold examinations and confer degrees in its special faculty. Many students from all the Scandinavian institutions took their examinations and degrees at Lund, after pursuing their studies at one or another of the other schools.

In these years of his university life, Retzius already began the productive literary and scientific labors which were soon to bring him distinction. In 1864, at the early age of twenty-two years, he collected, edited and published his father's contribu-

tions to ethnology, together with some of his father's letters. About this time also he began the comprehensive researches which resulted thirty-six years later in his monumental work, "*Crania Suecica Antiqua*," published in 1900. In 1871, the year in which he received his medical degree, he published a 58-page volume of sonettes, which must have been the accumulation of a number of years, and the following year, 1872, he published a small volume of translations into Swedish of some of the poems of Robert Burns.

This purely literary work, however, was to lapse for a number of years, for in 1871 he became a docent in anatomy at the Caroline Institute. He had already, in 1869, begun a series of researches in collaboration with Axel Key on the anatomy of the nervous system and the connective tissues which gained recognition from the French Academy in the bestowal upon Retzius of the Monthyon prize. In 1873, in company with Lovén and Nordensson he undertook a journey to Finland and Russia for the purpose of studying the anthropology of the Finns. This resulted in the publication in 1878 of his important work on "*Finska Kranier*." A monograph on "*Das Gehörorgan des Knochenfische*" appeared in 1874, and was the forerunner of important researches on the auditory organ of vertebrates, the larger results of which were published in 1881 and 1884, comprising two volumes with the title "*Das Gehörorgan der Wirbelthiere*." The figures of Retzius representing the inner ear and the organ of Corti are still reproduced in many modern text-books. These researches on the auditory organ were continued many years later after the introduction of the newer methods of nerve staining, and form the basis of several contributions in his "*Biologisches Untersuchungen*." They reveal his abiding interest in this difficult subject.

In 1877 Retzius was made "*personligt*" professor of histology at the Caroline Institute, and in 1888 was advanced to a full professorship. This, however, he resigned the following year in order to devote all his time to his investigations, an apparent ambition to occupy the position so long held by his father having been satisfied.

During the eleven years of his assistant professorship numerous contributions were made to histology and neurology. In 1881 and 1882 appeared two volumes of researches by himself and younger workers under his direction on purely histological subjects. These two volumes constitute the first series of his "*Biologisches Untersuchungen*." Because of other duties as he states in the preface to Volume I. of the new series which

was begun in 1890, and because he found opportunity to publish a series of researches in the proceedings of the Biological Society, the "Biologisches Untersuchungen" was allowed to lapse as a distinct publication for a number of years.

Some of these other duties to which he refers were of a nature usually quite foreign to the laboratory man. From 1884 to 1887 he was chief editor of the *Stockholm Aftonbladet*, a daily newspaper of considerable circulation. Retzius became connected with the *Aftonbladet* through his marriage with Anna Elizabeth Hierta, the daughter of the owner and founder on the paper, Lars Hierta. Hierta was a man of considerable wealth and of influence in his country. He held various offices, including a seat in the riksdag at various times. After his death, which occurred in 1871, his widow gave 100,000 kronor to the "hogskola" of Stockholm to establish a chair of political economy, and several years later she established a foundation of 400,000 kronor in memory of her husband.

It was this marriage, sympathetic as well as fortunate financially, which placed ample means at the disposal of Retzius for his later scientific work, and for the publication of this in the sumptuous form in which most of it is found.

A year after the resignation of Retzius from the chair of anatomy at the Caroline Institute, that is in 1890, appeared Volume I. of the New Series of "Biologisches Untersuchungen." These volumes appeared at intervals of from one to three years, until by 1914, eighteen volumes had been published. They are of folio size, illustrated with handsome plates, some 478 in all, many of which are in colors. The text is usually brief, but carefully descriptive of the various subjects treated, and in addition to the description, contains a review of the literature.

These volumes contain only work which he himself had done, as he states in the preface to the first volume. By far the greater number of the thousands of figures included in the numerous plates are indicated as drawn by his own hand. He employed an artist for such figures as required delicate lines and shading, but with a few and unimportant exceptions, the figures which were drawn from microscopic preparations, were his own work.

Retzius was very generous in his acknowledgment of the help afforded him by artists and photographers when he employed them. In the last three volumes of the "Untersuchungen," which include much cytological work, he also expresses great appreciation of the services of his technician for the beautiful preparations on which these studies were based.

It is impossible in a brief space to present any adequate conception of the content of these eighteen volumes. The first nine volumes were devoted very largely to the nervous system of various invertebrate groups, as the crustaceans, the annelids and others, and to the histology of different types of nerve terminations in both invertebrates and vertebrates. To these investigations he applied the then new Golgi and methylene-blue methods of staining. Many of these descriptions and figures have become an integral part of every general treatise on the histology of the nervous system.

Beginning with Volume VIII., however, appeared also a series of studies on the brains of eminent men. The first of these was a study of the brain of the astronomer, Hugo Gyldéns. In the preface to this volume, Retzius in a manner apologizes for the fact that three years had elapsed since the appearance of the last volume, but states in extenuation that "my time has been employed in other work—*e.g.*, in 1896 on the monograph 'Das Menschenhirn.'" This was a two-volume work which did much to clear up some of the most difficult parts of the morphology of the brain, *e.g.*, the structures related to the dentate gyrus and other parts of the rhinencephalon. This work included not only a study of the adult brain, but the brains of a large series of human fetuses of various stages of development were included.

Another subject which attracted Retzius was the study of the spermatozoa of various groups of animals, from invertebrates to man. The sperms of scores of species were described and figured, and considerable attention was paid to a comparison of these cells in the higher apes and in man.

Volume XV. of the "Biologische Untersuchungen" (1910) contains the first of a series of cytological studies on the ova of various invertebrates, chiefly Echinoderms. Retzius was now sixty-eight years old and it is remarkable that at this age he should still keep sufficiently abreast of the newer developments of biological science to take up research in a field which presents so great technical difficulties. The drawings, and apparently the preparations for these first studies were made by himself, for in Volume XVI. (1911) for the first time appears any reference to the work of a technician.

The wide range of his friendship with the scientific men of Europe is indicated by the dedications of these handsome volumes. The names of Kölliker, Nansen, Cajal, His, von Ebner, Schwalbe, Waldeyer, Oscar Hertwig, and others, usually with the inscription, in "friendly veneration" adorn the dedicatory

pages of his volumes. Other volumes are dedicated to various members of his family. The scientific work of Retzius received widespread recognition by his election to honorary membership in the learned societies of the chief cities of Europe and America—indeed, the catalogue of the societies to which he was elected is very similar to a list of the capitals of Europe, with Philadelphia and Washington added. Honorary degrees were conferred upon him by the Universities of Upsala (1893, Ph.D.), Bologna, Wurzburg, Cambridge, Geneva and others, and various governmental recognitions were bestowed.

In 1908 he was called upon to deliver the Croonian lecture before the Royal Society of London. He chose for his topic "The Principles of the Minute Structure of the Nervous System as Revealed by Recent Investigations." A perusal of this lecture, which is contained in the *Proceedings of the Royal Society* serves well to reveal the modesty and pleasing address of the man. In the following year he returned to England to deliver the Huxley lecture before the Royal Anthropological Institute of London. On this occasion he spoke on the "So-called North European Race of Mankind." In this lecture he took a somewhat pessimistic view as to the ability of the Nordic race whose characteristics the studies of his father and himself had done so much to differentiate, to meet modern conditions of industrial life in competition with the smaller bodied, vegetable-eating races of southern Europe. The Nordic race requires the open country and flesh for food. It is a race of warriors, administrators and farmers, not of city dwellers or workers in factories. Such are the outlines of his thesis.

Professor Keith, the celebrated English anthropologist who heard him on that occasion writes³

No fellow of the Institute who had the fortune to listen to the Huxley lecture of 1909 can forget the graciousness, courtesy and modesty of the lecturer, nor the pleasant memories which his wife and he left with his audience.

In summing up his scientific work we may again quote Keith who says

He did more to enrich the literature of physical anthropology, anatomy, and physiology than any other man of his time. His numerous monographs deserve to be called princely, whether we consider the finish, the magnificence of their illustrations, their full and accurate record of observation, or the exactness of the methods which were employed in their production.

³ Keith, A., Gustav Magnus Retzius, *Man*, Vol. XIX., No. 10, October, 1919.

No picture of Retzius would be complete without further reference to his other than strictly scientific activities. In 1884, as already noted, he became head editor of the *Aftonbladet*. His early literary work had been excellent preparation for this position, which he filled for three years. Numerous contributions on politics, sketches of his travels, and biographical sketches of scientific men, foreigners as well as his own countrymen, were made by him through the columns of this daily paper during this period, and also after he relinquished his editorial duties.

Retzius made numerous journeys to the various countries of Europe, and also to other continents. The benefit of these travels he shared with his countrymen, so far as was possible through the sketches to which reference has already been made, and through a volume of 372 pages, which appeared in 1891, entitled "Pictures from the Nile Country." Another volume of 96 pages appeared the following year on "Pictures from Sicily." In 1893 and 1894 appeared a series of 34 letters in the *Aftonbladet*, called "Pictures from North America."

Reference has already been made to the early literary work which through the pressure of his scientific researches was neglected for a number of years. That Retzius continued his interest in poetry, however, and in music, despite his expressed diffidence in understanding the latter, is evident in the publication in 1911 of a 242-page octavo volume of poems, and in the preparation by him of two cantatas. The first of these appeared in 1898 on the occasion of the celebration of the memory of Jacob Berzelius, for many years the Nestor of modern chemistry in the early part of the nineteenth century. The second cantata was produced at the celebration under the auspices of the Royal Academy of Stockholm, of the 200th anniversary of the birth of Linnæus, May 25, 1907.

Retzius's greatest interest, however, aside from his researches, apparently lay in the same direction to which we are at present turning our thoughts, namely, in the lives and personal history of the makers of science. Some fifty biographical sketches of scientific men, for the most part workers in the biological sciences, were published by him. Most of these were published in the *Aftonbladet*, in an effort to make more widespread the gospel of scientific work. In connection with this phase of his intellectual activities he became interested in the anatomical and physiological writings of Emanuel Swedenborg, to which he gave considerable study. For a time, including the year 1903, he served as president of the Swedenborg committee

of the Swedish Academy of Sciences, whose purpose was to bring to light some of the forgotten discoveries of the mystic genius whose writings they studied.

To give in the briefest form possible a comprehensible glance at the activities of Retzius, as evidenced by his published work, we may divide his publications into five groups. Group 1, representing his work in natural science, includes 127 titles, many of which represent one or more large volumes. Group 2, which represents his studies in biography, includes 50 titles. Group 3, his travel sketches, were published under 24 different titles. Group 4, poems and literary translations, is represented by 5 titles, and Group 5, which includes his political essays and miscellaneous contributions, includes some 35 titles. To these, numbering 244 contributions in all, should be added several volumes which were edited and published by Retzius, such as the ethnological writings of his father, and two volumes which included letters of his father, Anders Retzius, to various men. These constitute his bibliography to the year 1914.

In addition to membership in the leading scientific societies of Europe and America, and the bestowal of honorary degrees by a number of universities, Retzius also received recognition as the recipient of various prizes from scientific bodies.

He died on July 21, 1919, full of honors and of years, for he was seventy-seven years of age. He had seen the science of anthropology established, and had made important contributions to it. Likewise he had taken an important part in the development of many phases of histology, and had been one of the pioneers in the study of the nervous system by modern methods. It appears likely that in the histology of the nervous system, especially, the name and contributions of Retzius have found a permanent place.